

Charge-exchange reactions on ^{136}Xe : Gamow-Teller strength distributions*

O. Moreno¹, R. Álvarez-Rodríguez¹, P. Sarriguren¹, E. Moya de Guerra^{1,2†}

¹IEM, CSIC, Serrano 123, E-28006 Madrid, Spain.

²Dpto. FAMN, UCM, Ciudad Universitaria, E-28040 Madrid, Spain.

Abstract

We present here theoretical calculations regarding the first experimental test of EXL feasibility at GSI with ^{136}Xe . Our results concern the Gamow-Teller strength distributions of this nucleus, which are directly related to the cross section of charge-exchange reactions. Results on ^{132}Xe isotope have also been obtained for spherical and for stable deformed shapes.

Our theoretical framework starts with an axially-deformed Hartree-Fock mean field with effective two-body Skyrme interactions which includes pairing correlations within BCS approximation. Gamow-Teller excitations are described within QRPA with a spin-isospin residual interaction in the particle-hole (ph) and in the particle-particle (pp) channels, with coupling constants consistent with the mean field approximation.

We first obtain the Hartree-Fock energy as a function of the quadrupole deformation parameter β using several Skyrme forces for the sake of comparison. For ^{136}Xe a minimum of the energy is found corresponding to a spherical nuclear shape. For this spherical solution we have obtained the GT^- and GT^+ strength distributions, which could be extracted, under the appropriate kinematic conditions, from the following charge-exchange reactions:

GT^- :
 $^{136}\text{Xe}(p,n)^{136}\text{Cs}$; $^{136}\text{Xe}(^3\text{He},^3\text{H})^{136}\text{Cs}$; $^{136}\text{Xe}(d,2n)^{136}\text{Cs}$

GT^+ :
 $^{136}\text{Xe}(n,p)^{136}\text{I}$; $^{136}\text{Xe}(^3\text{H},^3\text{He})^{136}\text{I}$; $^{136}\text{Xe}(d,2p)^{136}\text{I}$

Fig.1 shows GT^- and GT^+ strength distributions for a spherical nuclear shape using Sk3 Skyrme force. Discrete, gaussian-folded and accumulated strength distributions are included up to an excitation energy of the residual nucleus of 20 MeV.

Calculations of cross sections as well as results of calculations for other isotopes are under way and will be presented in our next report.

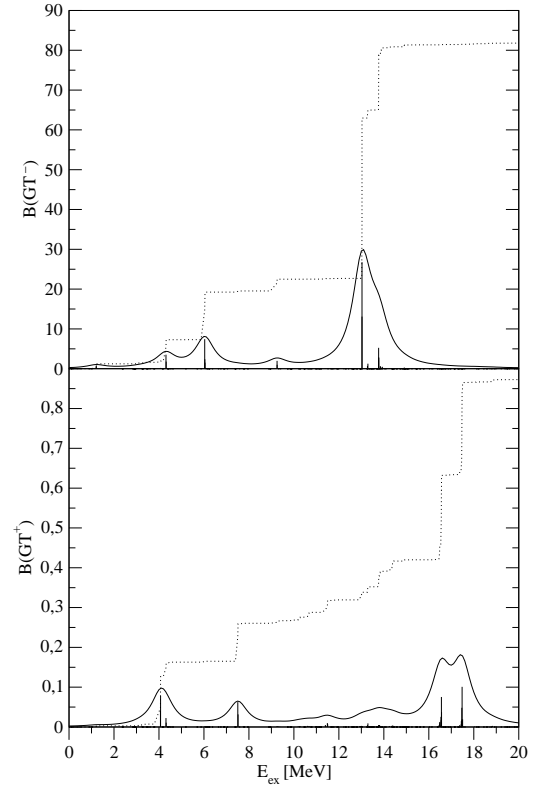


Figure 1: ^{136}Xe GT^- and GT^+ strength distributions a) discrete b) folded (—) and c) accumulated (····). Results are obtained for the spherical ground state using Sk3 Skyrme force and fixed pairing gap.

* Work supported in part by European Commission R113-EURONS-506065.

† elvira.moya@iem.cfmac.csic.es